

User's Guide
to the
SMLP 5-5
Singlemode / Multimode Light Pack

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1.0 General

Thank you for purchasing a Noyes Fiber Systems SMLP 5-5 Singlemode / Multimode Light Pack. The SMLP 5-5 provides the tools necessary to perform power and loss measurements on fiber optic transmission systems. The SMLP 5-5 includes the OLS 5-5 Light Source, the OPM 5-2C Optical Power Meter, an adapter cap, carry case, PC software, serial cable, protective rubber boots, trace pads and user's guides.

The OLS 5-5 is a stable light source with three outputs: 850, 1300, and 1550 nm. The OPM 5-2C is a full featured optical power meter calibrated at 850, 1300, 1310, and 1550 nm. Both units are lightweight, hand-held, and operate from a single 9V battery.

A fiber optic connector adapter cap of your choice is provided with the OPM 5-2C. The OLS 5-5 is available with ST connectors. A carry case is provided for convenient storage and transportation.

2.0 Functional Descriptions

2.1 OLS 5-5 Light Source

1 - 850 nm Output Port and Adjustment - The 850 nm optical output is a ST connector. Nominal output power is -20 dBm into 62.5/125 μ m fiber and may be adjusted by ± 1 dB.

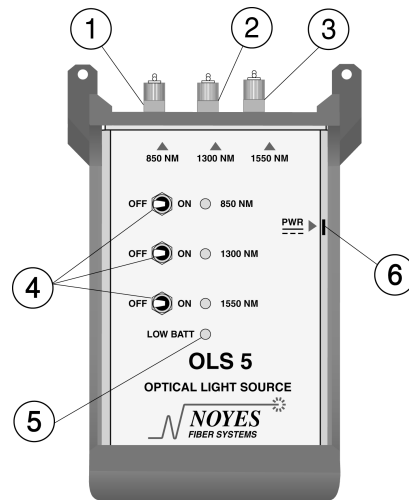
2 - 1300 nm Output Port and Adjustment - The 1300 nm optical output is a ST connector. Nominal output power is -20 dBm into 62.5/125 μ m fiber and -38 dBm into 9/125 μ m fiber and may be adjusted by ± 1 dB.

3 - 1550 nm Output Port and Adjustment - The 1550 nm optical output is a ST connector. Nominal output power is -10 dBm into 9/125 μ m fiber and may be adjusted by ± 1 dB.

4 - Power Switches - The power switches activate and deactivate the selected outputs.

5 - Low Batt - This LED indicates that the remaining battery life is less than approximately 1/2 hour.

6 - External AC Power Jack - The OLS 5-5 may be operated by an AC power adapter. Plugging the AC adapter into this jack will automatically switch the OLS 5-5 from the internal 9 volt battery to the external power supply.



**Figure 1 - OLS 5-5
Light Source**

2.2 OPM 5-2C Optical Power Meter

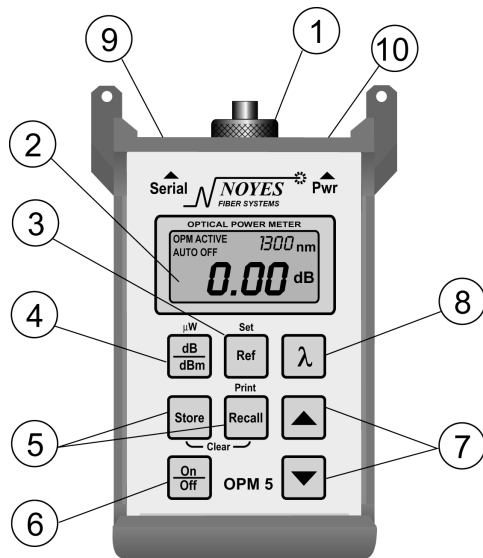


Figure 2
OPM 5-2C Optical Power Meter

1 - Universal Adapter Interface - The threaded optical detector interface allows connection to various fiber optic connector styles. Adapter caps, purchased separately, convert the adapter interface to the required connector style. Refer to section 3.2 for a list of available adapter caps.

2 - Liquid Crystal Display - Measurements are displayed in the lower four digits in absolute power (dBm or μ W) or direct loss (dB) with annunciators defining REF (a reminder that measurements are referenced), and BAT (low battery). Resolution is 0.01 dB (.0001 μ W) or (.1 dB selectable). The wavelength is displayed in the top four digits. Out of range HI and LO are displayed in lower digits.

The OPM 5-2C will automatically detect tone at 270 Hz, 1000 Hz, and 2000 Hz. When tone is detected, the upper display will alternate between the current wavelength and the tone detected.

3 - Ref - Holding the **Ref** key until "HELD" is displayed (approximately three seconds) stores the dBm input as a reference power level. The OPM 5-2C automatically switches to a loss mode and displays the dB difference between the reference level and current input. Selecting the **Ref** key briefly displays the stored reference.

4 - dB/dBm - Selecting the **dB/dBm** key toggles between absolute power (dBm) and loss (dB) modes. Holding the **dB/dBm** key until "HELD" is displayed

(approximately three seconds) switches the OPM 5-2C to a microwatt (μW) mode.
Note: Switching between dB, dBm, and μW will not affect the stored reference levels.

5 - Store and Recall - Selecting the **Store** key saves the currently displayed reading in the next available memory location and flashes the location number. The OPM 5-2C stores 500 measurements for each wavelength.

Selecting the **Recall** key enters the "recall mode" to allow viewing, editing, and printing of stored measurements.

View: Use the \wedge and \vee keys to increment or decrement the memory locations and view the stored measurements.

Edit: Select the memory location to edit. Holding the **Store** key until "HELD" displays temporarily returns the OPM 5-2C to a measurement mode. Remeasure the fiber and select the **Store** key to save the new reading.

Print: Hold the **Recall** key until "HELD" displays. The stored data is transferred to a PC (using the supplied software) or a serial thermal printer (optionally available).

Hold the **Store & Recall** keys down together until "HELD" displays to clear all stored data at the currently selected wavelength. Select **dB/dBm**, **Ref**, or λ keys to exit the recall mode.

6 - On/Off - Selecting the **On/Off** key powers the OPM 5-2C on or off. Battery life is automatically conserved by powering off if no keys are selected within approximately 5 minutes. Disable the automatic shut-down by holding the **On/Off** key down during power up until "P" displays.

7 - \wedge and \vee - In the **Recall** mode, the \wedge and \vee keys increment or decrement the memory location. To select .1 dB resolution, press and hold the \wedge key during power up. To deactivate the serial port, press and hold the \vee key during power up.

8 - λ - The Greek symbol lambda (λ) is used to denote wavelengths of light. Selecting the λ key defines the measurement wavelength. The wavelengths available depend on the model - see the specifications section. Annunciators in the LCD will display the currently selected wavelength.

Holding the λ key until “HELD” is displayed (approximately 3 seconds) briefly displays the percentage of battery life remaining.

9 - Serial - The **Serial** connector is used for printing or transferring previously stored loss measurements. Data can be printed to an optional thermal printer or transferred to a PC for complete report generation using the supplied software.

10 - AC Input - The OPM 5-2C may be operated from an external AC power adapter.

3.0 Applications

This section will discuss the use of the OLS 5-5 Light Source and the OPM 5-2C Optical Power Meter. It is important to follow the precautions given below to ensure proper operation.

3.1 Precautions

Use care when working with any optical transmission equipment. It is good practice to avoid looking directly at the outputs any optical fibers or optical sources. Always refer to your company safety procedures when working with optical systems.

CAUTION: The use of controls or adjustments or performance of procedures other than specified herein may result in hazardous laser light exposure. The OLS 5-5 is a registered CLASS 1 LASER PRODUCT.



It is important to keep all optical connections and surfaces free from dirt, oils, or other contamination to ensure proper operation. Scratched or contaminated connectors can reduce system performance. Always replace protective dust caps where available.

3.2 Required Accessories

The OPM 5-2C Optical Power Meter requires an "**Adapter Cap**" to interface to the fiber optic system under test. Note that an adapter cap of your choice is provided with the SMLP 5-5 kit. Having an assortment of adapter caps on hand would allow the greatest flexibility if there is limited access to patch cables. A variety of adapter caps are available, please contact Noyes Fiber Systems to determine the availability of adapter cap types that are not listed below.

1.25mm Universal	8800-00-0224	Bare fiber	8800-00-0206
2.5mm Universal	8800-00-0214	Radial PFO/VFO	8800-00-0212
FC	8800-00-0200	ESCON	8800-00-0210
SC	8800-00-0209	DIN 47256	8800-00-0211
ST	8800-00-0202	FDDI Kit	8800-00-0215
E-2000 (Diamond)	8800-00-0221	FDDI	8800-00-0205
Biconic	8800-00-0204	D4	8800-00-0201
SMA	8800-00-0203	1000 μ m	8800-00-0223
LC Simplex/Duplex	8800-00-0225	MU Simplex	8800-00-0226
Backplane SC	8800-00-0219	MT-RJ, A and B side	8800-00-0231

Optical Jumper Cables are recommended to interface the SMLP 5-5 to the system under test. The jumper cables require the appropriate connectors on each end to match the system under test's connector style to the OLS 5-5 connector style and the adapter cap on the OPM 5-2C. Various cable styles and lengths are available from Noyes Fiber Systems.

A fiber optic connector adapter (also called a coupling adapter or bulkhead) is required to mate two fiber cables together.

Fiber optic cleaning supplies, such as optical wipes, optics grade alcohol, or cartridge style dry cleaners, should be used to clean the fiber connector ends. Also, a can of filtered compressed air is useful for blowing out contaminants from adapters.

3.3 Typical Applications

The SMLP 5-5 Singlemode / Multimode Light Pack is used to perform diagnostic and evaluation measurements associated with fiber optic transmission systems and cable plant. Applications for the SMLP 5-5 will be found within the telecommunication, cable television, data network, and industrial control industries.

The SMLP 5-5 kit measures absolute power (in dBm or μW) and loss (dB). Absolute power expressed in dBm is the amount of optical power received by the detector as compared to 1mW (0dBm=1mW). Measuring dBm is useful for verifying the output power of an optical transmitter.

Loss is the difference in optical power from a known input (the reference level) and the output power at the opposite end of the fiber under test. The OPM 5-2C can display dB loss directly after a reference level has been set. Loss measurements are used to qualify cable plant links and fiber optic jumpers.

Microwatts is also a way to measure absolute power. Some manufacturers specify their transmission equipment in watts instead of dBm. The OPM 5-2C offers the ability to measure watts for convenience when verifying output power of transmitters.

For accurate results, always be sure to set the OPM 5-2C to measure the same wavelength as the output of the source or transmitter.

3.4 Optical Reference Level (Step A)



Figure 3 - Reference Level Diagram

1. Turn on the OPM 5-2C. Select the test wavelength by pressing the λ key.
2. Turn on the appropriate power switch on the OLS 5-5 and allow the light source to stabilize for at least one minute.
3. Clean all fiber connections. Jumpers must be the same fiber type as the fiber under test (50/125 μm or 62.5/125 μm multimode, or 9/125 μm singlemode).
4. Using a launch jumper, connect the OLS 5-5 Optical Light Source to the OPM 5-2C Optical Power Meter (see Figure 3).
5. Set the OPM 5-2C to **dBm** mode. The power reading indicated by the display should be approximately -20.0 dBm @ 850 nm ; -20 dBm @ 1300 nm on 62.5/125 μm fiber; -38 dBm @ 1300 nm; and -10 dBm @ 1550 nm on 9/125 μm fiber. If this cannot be achieved, adjust the output power of the OLS 5-5. If this still cannot be achieved, try cleaning the optical connections again and check for excessive bends in the fiber or contact Noyes Fiber Systems for assistance.

6. If the dBm reading is acceptable, hold the **Ref** key until "HELD" displays. The meter automatically "zeroes" the display and begins measuring direct loss. The display will read 0.00 dB. The hundredths' digit may vary slightly due to movement of the fiber and minor variations in the output power from the OLS 5-5.

3.5 Optical Loss Measurement (Step B)

1. Without removing a launch jumper from the OLS 5-5 Optical Light Source, connect the OLS 5-5 and OPM 5-2C Optical Power Meter to the fiber (link) under test (see Figure 4).
2. The OPM 5-2C displays the end-to-end loss of the fiber under test (the example shows 1.47 dB).
3. Select **Store** to save the loss measurement in the next available memory location.

EXAMPLE:

Reference (near end) measurement = -20.00 dBm

Far end measurement = -21.47 dBm

End-to-End Loss = 1.47 dB

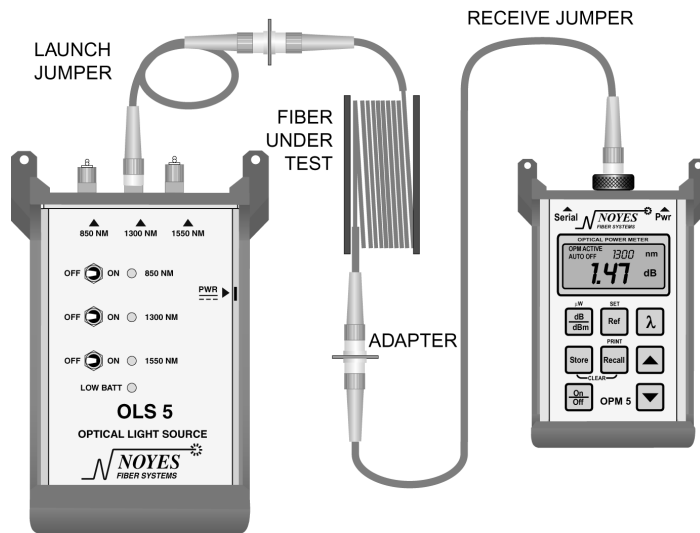


Figure 4 - Fiber Loss Diagram

3.6 Editing a Specific Memory Location

The OPM 5-2C provides 500 memory locations for each of the four wavelengths. A specific memory location can be changed to correct errors or bad measurements found when viewing the data.

Example: You test and store the measurements for a 48 fiber bundle. After transferring the data to the PC you analyze the results and find that location #23 appears to have had a problem. You then take the OPM 5-2C back in the field to edit location #23 and remeasure or fix the fiber.

To Edit:

1. Select the appropriate wavelength by pressing the **λ** key.
2. Press the **Recall** key and use the **^** and **v** keys to choose the memory location number to edit.
3. Hold the **Store** key until "HELD" displays. The OPM 5-2C returns to measurement mode.
4. Remeasure the fiber and select the **Store** key to save the new reading.

When you return to the PC, transfer download the data again. Now the data has been corrected, eliminating the need to print a correction addendum to a report.

3.7 Verifying Output Power

1. Turn on the OPM 5-2C and select the proper wavelength by pressing the λ key. (Check the specifications of the transmitter to determine the correct wavelength.)
2. Turn on the transmitter and allow it to stabilize.
3. Clean the fiber connector and connect to the OPM 5-2C.
4. Set the OPM 5-2C to **dBm** mode. (The example in Figure 5 shows a power reading of -16.42 dBm).

If the manufacturer specified the output power in watts, then hold the **dB/dBm** key until "HELD" is displayed to change the OPM 5-2C to measure microwatts.

The measured level should be within the specifications of the light source manufacturer. If it is not, try cleaning the fiber connector again and check for excessive fiber bends. A "LO" displayed indicates no light is present at the meter and a "HI" indicates too much light is present for the OPM 5-2C to measure (see specifications).

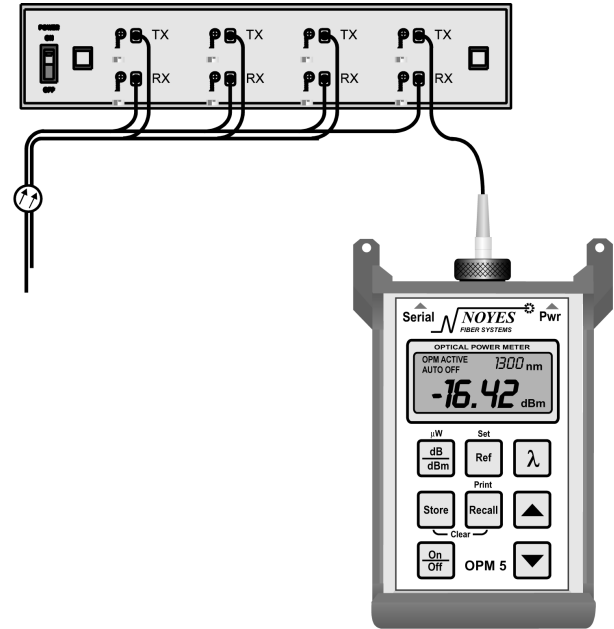


Figure 5 - Verifying Output Power

4.0 Maintenance/Calibration

4.1 Battery Replacement

To replace the existing battery in either the OPM 5-2C or the OLS 5-5, remove the battery compartment cover on the back side of the unit. Place a 9V battery in the unit and then replace the cover.

4.2 Cleaning Optical Ports

OLS 5-5 Light Source - The optical output connectors must be kept free from dirt or other contamination. Most contaminants can be removed by using a can of filtered compressed air. It is important to keep the dust cap in place when the unit is not being used.

OPM 5-2C Optical Power Meter - The optical detector must be kept free from dirt or other contamination. The detector should be periodically cleaned using a low-lint optical grade tissue with optics grade alcohol or by using a can of filtered compressed air. It is important to keep the dust cap in place when the unit is not being used.

4.3 Calibration

Calibration of the SMLP 5-5 is recommended every 12 months. Please refer to section 5.4 for information on returning equipment.

5.0 Warranty Information

5.1 One Year Limited Warranty

All Noyes Fiber Systems' products are warranted against defective material and workmanship for a period of one year from the date of shipment to the original customer. Any product found to be defective within the warranty period would be repaired or replaced by Noyes Fiber Systems. In no case will Noyes Fiber Systems' liabilities exceed the original purchase price of the product.

5.2 Exclusions

The warranty on your equipment shall not apply to defects resulting from the following:

1. Unauthorized repair or modification.
2. Misuse, negligence or accident.

5.3 Warranty Registration

A warranty registration card is included with the original shipment of equipment. Please take a few moments to fill out the card and mail or fax it to Noyes Fiber Systems to ensure proper initiation of your warranty term.

5.4 Returning Equipment

To return equipment, please contact Noyes Fiber Systems to obtain additional information and a Return Materials Authorization number (RMA#). To allow us to serve you more efficiently, please include a brief description describing the reason(s) for the return of the equipment.

NOYES FIBER SYSTEMS
16 EASTGATE PARK ROAD
BELMONT, NH 03220

TEL: 800-321-5298 OR 603-528-7780
FAX: 603-528-2025

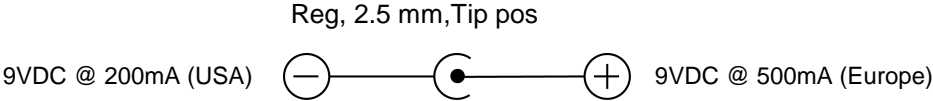
6.0 Specifications

MODEL	SMLP 5-5	
Optical Power Meter	OPM 5-2C	
Calibration Wavelength (nm)	850	1300, 1310, 1550
Tone Detection Range (dBm)	+6 to - 30	+6 to - 35
Tone Detection Frequency (Hz)	270 \pm 13.5	
	1000 \pm 50	
	2000 \pm 300	
Detector Type	Germanium (Ge)	
Measurement Range	+6 to -60 dBm	
Accuracy (@ 25°C & -10.0dBm)	\pm 0.25 dB	
Resolution	0.01 dB (.1 dB selectable)	
Power	>30 hrs. typical operation with 9V Alkaline	
Adapter Caps	ST (other styles available)	
Size (H x W x D)	5.5 x 3.2 x 1.5 in (14.0 x 8.1 x 3.8 cm)	

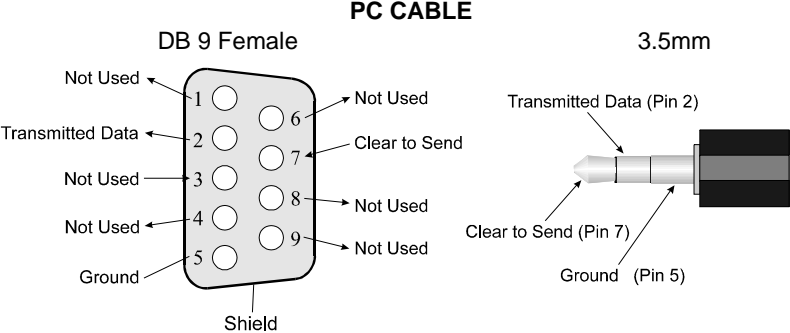
Light Source	OLS 5-5	
Emitter Type	LED (850 & 1300 nm), LASER (1550 nm)	
Emitter Classification	Class 1, (FDA CFR 21 and IEC 825)	
Wavelength	850, 1300, 1550 nm	
Stability (@25°C & 20 min. warm-up)	\pm 0.1 dB / 1 hr.	
Output Power		
Multimode (62.5/125 μ m)	-20 dBm @ 850 nm, -20 dBm @ 1300 nm	
Singlemode (9/125 μ m)	-38 dBm @ 1300 nm, -10 dBm @ 1550 nm	
Power	>8 hrs. typical operation with 9V alkaline, AC adapter optional	

Optical Connectors	ST
Size (H x W x D)	7.25 x 4.4 x 1.75 in (18.4 x 10.2 x 4.4 cm)
General Kit Specifications	
Dynamic Range of Test Kit Multimode (62.5/125μm) Singlemode (9/125μm)	40 dB @ 850 & 1300 nm 22 dB @ 1300 nm, 50 dB @ 1550 nm
Weight	3.3 lbs.(1.5 kg)
Dimensions (H x W x D)	12 x 12.5 x 4.75 in (30.1 x 31.7 x 12.0 cm)
Operating Temperature	0° to 50° C
Storage Temperature	-30° to 60° C

Power Port



RS-232 Pin Designations



Thank You for Choosing
Noyes Fiber Systems



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